INDIANA OFFICE OF
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DEVELOPMENT

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Defense Electronics Business Plan

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DEFENSE ELECTRONICS HIGH LEVEL BUSINESS PLAN

Defense Electronics involves the design, manufacture, and product life cycle support of systems critical to the way the military and homeland security conducts those operations. These systems involve command and control and wireless communications. The strength and number of the State's assets in this focus area indicates that this is a critical mass that will generate even more business from this customer set through greater success of the existing prime contractors, the mission of Crane for defense electronics, and the capacity of the academic institutions to produce needed skills and IP. Because of the complexity of modern electronic system in this customer set, there is a compelling case for collaboration that would involve not only current organizations working with this customer set, but also new electronics organization that are not yet doing business with DOD or Homeland Security.

DETAILED DESCRIPTION:

This focus area addresses electronic products, systems, and services to assist military, homeland security, and aerospace operations that would involve:

- Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR)
- Voice/data/video communication networks and joint radio programs within the battlefield/disaster
- Operation and up to higher levels of command
- Sensor networks
- Radar
- Display Systems
- High Reliability Electronics (including Radiation Hardening and Proton Analysis)
- Power Amplifiers
- Electronic Warfare (Jamming, Directed Energy, and Weak Signal Detection; Lethal or non-lethal).

This focus area encompasses the technology insertion, development, manufacturing, product enhancement, and life cycle management of products and services.

Military challenges in this area include: avoidance of detection and interference with civilian operations through such technological strategies as frequency agile radios and exploitation of the extreme limits of the radio spectrum (Millimeter waves, Free Space Optics, Ultraviolet), self-forming networks of personnel, assets, and networks with increasingly smaller packages, cost, and power consumption, peer networking among warfighters and the command structure, allowing the warfighter to process more information through techniques such as mixed reality and 3D visualization, and the coexistence and migration of legacy radio systems with/to modern digital radio systems.

Homeland defense operations (i.e., First Responder, Border Patrol, and Coast Guard) have these same challenges. Solutions to these challenges also have potential with America's coalition partners and in its covert intelligence operations.

Products and services in this area must support net centric operations as well as meet key requirements in equipment protection, reliability, and the weight/size/power profile.

Platforms for these electronics subsystems and components include aircraft, land vehicles, sea-bound vessels, missiles, and space and near-space vehicles in piloted and autonomous modes, as well as the warfighter (personnel in homeland security roles) and sensor network devices.

Knowledge assets needed in this focus area are: Rapid Prototyping, Composite Materials, Nanotechnology, Radio Frequency Engineering, Radio frequency terrain modeling, Radio testing, MEMS, Software Defined Radios, Ad-Hoc Networks, Systems Engineering, Power Management, and Electronics Design and Test Software.

IMPORTANCE FOR INDIANA TO FOCUS AND COLLABORATE ON DEFENSE ELECTRONICS

DOD and Homeland Security mount complex operations that are dependable and easy to standup and maintain. They call this being Net Centric. It has been the driver for transformation in the military for almost a decade and, as the Katrina operation underscored, a much desired capability to develop for national disasters (natural or man made). Elements consist of:

- Command and control centers that include Intelligence gathering (called C4ISR in the military)
- Interfacing to Heterogeneous wireless networks in a seamless manner
- Protection from all forms of disruption
- Electronic systems for force protection and attack
- Countermeasures
- Intelligent systems
- Visualization and training
- Autonomous systems

Opportunities to provide and enhance such networks are being now being announced by the customers targeted by this study. The dollar potential is very large because this amounts to creating sophisticated networks with state of the art technology (e.g., ad hoc networks, satellite communications, and mixed reality information visualization) that is equivalent to the size of today's commercial networks in a region.

No one company has the one solution and that is why DOD and Homeland Security have stressed organizations banning together to give them the best solution. This is not an ability one state has within its borders. In fact, it is wise politically to have multi-state representation in a bid. However, the Defense Electronics knowledge assets and relationships resident in Indiana can form a basis for successful team bids by prime contractors within and without the state. The plurality of these assets and relationships means that Indiana can spread the risk in winning some part of a large opportunity within its borders.

The increase in threat vectors faced by the United States has sped up the military and homeland security generation of requirements and the need to quickly satisfy them. This can only be supported by networks of clusters that contain the tools for development already in place. This has been proven by the successes of Florida, California, Virginia, and recently Alabama.

Contracts in Defense Electronics are technology driven and will need a higher level of skills that will reduce the brain drain and allow Indiana to move up the food chain as manufacturing leaves the state. Since the Indiana workforce is a stable one, it can be transitioned to Defense Electronics easily.

There is an accelerator built into the Defense Electronics business that was not the case for Automotive and earlier Consumer Electronics. Where defense platforms change every 20 to 30 years, defense electronics systems change every three years and are refreshed every 18 months. This enables greater revenue and puts an emphasis on building new knowledge and tradecraft.

Additional assets are available that have been addressing the commercial marketplace, and these assets represent a multiplier for defense/homeland security revenue. Many commercial markets are trending to have their manufacturing and support services go offshore and, in some cases, engineering services. Department of Defense business will tend to stay in the United States. Commercial electronics firms offer a path for Defense Electronics technology with a civilian use.

Table 30 below indicates the existence of both Defense Electronics (current) and Commercial Electronics (potential) assets. They are spread throughout the state with major clusters at W. Lafayette (Purdue and small electronics companies), Fort Wayne (five prime contractors involved), Crane, and Central Indiana (automotive heritage). These assets include such unique identifiers as: being a prime for the current battlefield radio system SINCGARS (IT&T in Fort Wayne); creating a balloon based mesh network (StratoStar in Upland); offering a radio frequency test range (Crane), national leadership in Electronic Warfare (Crane), having a legacy electronics production facility (CRANE), competency in radiation hardening design, analysis, and testing (numerous locations), and possessing state-of-the-art knowledge in software defined radios (Raytheon).

Indiana's assets, especially in smaller electronics engineering companies, will enable early prototypes to be coordinated within the state and through the new Urban Warfare Center centered around Muscatatuck. This will give those companies an advantage in introducing their new technology directly to the operational military and homeland defense units for assured and faster acceptance by the ultimate end user – the warfighter, the first responder, and the operations planner.

Table 1

INDIANA ASSETS

University	Crane	Large Companies	Small Companies	
IU Cyclotron Program	UAV Competencies	IT&T (SINCGAR)	Omega Wireless	Tech Shot
PU Center for Advanced Manufacturing	Full spectrum Radar Engineering Support	Raytheon	Mudawar Thermal Systems	Technology Management Group
PU Communication Research Lab	Electronic Warfare	General Dynamics C4 Systems	Thorrn Micro Technologies	Broadcast Services (aka Teleplex)
PU Video and Image Processing Lab	LINAC	BAE Systems	L.S. Technology	PTS Electronics
PU Digital Signal Processing Lab	Microwave Technologies	Delphi Electronics & Safety	Odyssian Technology	Kimball Electronics Group
PU Electronic Image Systems Lab	Electro-Optical Systems	Siemens VDO	StratoStar Systems	Logikos
PU Multimedia Test Bed	Radiation Hardening	EG&G	Next Wave Systems	CTS
PU Wide Band Gap Research	Radio Frequency Testing Facilities	SAIC	Attero Tech	Jacyl Technology
PU CERIAS Fempto Second Optical Wave Shaping	Environmental Testing	Northrup Grumman	Trilithic	PC Krause and Associates
			Fortune Industries	
PU "Cloaking device"	Failure Analysis	**Other**		XADS
IPFW Center for Systems Engineering	Acquisition Logistics	Network Urban Operations Testbed	Indiana Space Grant Consortium	International Council on Systems Engineering (Indiana/Illinois and Crossroads of America chapters)
Taylor University LINAC	System Engineering	Air Wing – Fort Wayne	Electricore Consortium branch	
Joint University/ Business Video Compression project	Modeling and Simulation		Indiana National Defense Industrial Association	

There is a foundation for immediate action as the following initiatives have been identified by the Hoosiers already involved in this focus area:

- Electronics Analysis Test Bed
- Capture Missile Defense Agency business during move to Alabama
- A/D Microchip Competency Center
- Indiana Defense Network Grid

- UAV Center of Excellence
- RF Consortium
- Counter-IED Center of Excellence
- Networked Urban Operations Test Bed Partnership

There is also a crosscut of this focus group with each of the other identified focus areas, as electronics and wireless communications play an important part to each of these.

IN YEAR ONE:

1. A review of current state Defense Asset limitations for growth and company involvement and total picture (across companies)
2. A leadership team for Defense Electronics
3. A community of Interest with 50 companies registered
4. A conference
5. Two early success stories for collaboration
6. Establish (fund) this focus area as a Not For Profit as a coordinating arm (brokering, marketing etc.)
7. Identify three to five sub areas and develop Centers of Excellence around each; each with a roadmap and vision.
8. Identify a path for finding out of state partners/assets, starting with University of Illinois and Wright-Patterson AFB.
9. Identify/brief Legislators (state and federal) about Defense Electronics – its potential for the state, plans, and key needs from government

There is a dependency on a Defense Assets wide group to perform the following activities to meet this plan: a state marketing plan, a briefing on this report with the new university presidents and Ivy Tech's new chancellor, and elevation of importance of regional campuses in Manpower Development. It is expected that the team will participate in the planning and support for these activities.

IN YEAR TWO:

1. Be the major driver and contributor to getting the Networked Urban Operations Test bed (framework) established.
2. A Future Capability Operational Planning exercise to get in front of the government bidding process that is most time already wired to a specific team
3. Bring in national conferences involving Defense Electronics.
4. Engage state level agencies to get commitment for Centers of Excellence.

A Defense Assets-wide group to perform the following activities to meet this plan depends on the continual enhancement of a database for locating potential partners and a situation alert system. It is expected that the team will participate in the planning and support for these activities.

RECOMMENDED STAKEHOLDER ACTIONS

This focus area will depend on specific actions on the part of stakeholders within the state.[1]

PUBLIC/PRIVATE DEFENSE ASSETS CONSORTIUM

[1] Some of these actions have been collected across focus areas and will be presented as composite strategic recommendations later in this report. Where they are unique to Defense Electronics they have more detail.

- Facilitate better collaboration (meetings) between contractors, between universities, and Federal and State legislators to build relationships, catalyze efforts to address specific initiatives/contract opportunities, and discuss issues.
- Organize national meeting with government program managers and chief technology officers to learn about capabilities needed by DOD and Homeland Security and to familiarize them with Indiana assets.
- Create a Commercialization Center for Defense SBIR Phase II companies.
- Create and manage a program for marketing Indiana as a defense technologies state.
- Attract angel/VC for IN Defense Electronic funding.
- Provide guidance (how to, best practices) to focus action teams for creating a Center of Excellence.
- Work with Crane to tap into its acquisition authority, e.g., UAV payloads.
- Encourage entrepreneurship in Defense Electronics. This focus area can benefit from new ideas because of its high technological turnover (demand) and the abundance of electronic engineers.

STATE GOVERNMENT

- Provide education for a small company new to Defense procedures and terms. DOD contracts are requiring a larger portion of work to be done by small and/or minority-owned business.
- Give first-time proposers SBIR proposal preparation assistance.
- Put the 21st Century Fund SBIR matching program on a sustainable basis.
- Legislation that clears the way for advanced airborne technologies testing in designated areas of state. This would bring the airframe manufacturer to the defense electronics prime for quicker time to user, especially when used in conjunction with the Urban Warfare Training Center.
- Institute a rapid response grant proposal process.
- Own the statewide database of available state assets. The current prototype was not useful in locating Radio Frequency oriented assets.
- Facilitate the wireless test bed.
- Facilitation bridge funding program to provide funding for an awarded contract while the contract is being written and before 1st payment

INDUSTRY

- Develop a program and strategies to involve engineering students who are foreign nationals. A hallmark of having a world class Electronics program is that it attracts the brightest from around the world. It is important for a company to attract these students as permanent hires and make them productive on DOD work as soon as possible.
- Create a Defense Electronics grid for large computing capacity needs patterned after I-Light (the state university grid).
- Encourage employees to work on university project (and universities to include company people in their projects. (See academia's need to protect company IP below)
- Matching scholarships for Juniors and Seniors
- Set up technology networking among academics and companies for specific areas (for example, Radio Frequency).

CRANE

- Shift work to contractors in Westgate Technology Park as much a possible. This in turn requires academia to shape a workforce to meet the needs of the offloaded work.
- Continue to provide the facilities of the Technology Engagement Office and expand its capabilities for Defense Electronics.

ACADEMIA

- Dramatically expand the Systems Engineering program across the state. This is a very high priority in this focus area because of an existing shortage of this skill.
- Engage students in industry-based problems/pursuits.
- Provide education in program management. This is a high priority because of the complexity in working on defense electronics projects.
- Improve the technology transfer process to release more technology for commercialization by commercial state assets without endangering the latter's competitiveness.
- Improve a company's access to university resources.

ORGANIZATION AND SUSTAINABILITY

For ultimate success, this focus area must have some initial wins to show that collaboration is effective and to attract other companies, especially SMEs not yet doing business with the government, into the effort of gaining money from these customers. This means that the organizational structure has to avoid the heavy-handed processes of the past and proceed in a self-organizing network manner.

METRICS

The following parameters are recommended as a source for three to seven vital performance measures:

- # companies and # employees
- Growth in total $$ (by university, industry, color/type, etc.)
- Patents and publications
- Number of funded COEs
- A network of qualified vendors that can meet contractual requirements.
- Mentor/Protégé program that helps new companies understand processes.
- Track the number of contract based collaborations between large and small companies and industry and universities – should be increasing over time
- Win percentage of contracts versus submissions
- Conferences
- Growth in national rank in Defense Electronics, by way of other states
- Number of IP and internships and industry academic loans

SUMMARY

Defense Electronics already has a strong position in Indiana. However, the scene is shifting to requiring more collaboration to win and delivery contracts. A focus action team, such as the one recommended here, must achieve the following Goals:

1. Access to a central "consortium" that can manage marketing, the high level customer relationships, centralized infrastructure, a reputation for success, high level state relationships, and growth/renewal
2. An active, ongoing program to recruit, involve, and assist new SMEs in obtaining Defense Electronics business
3. An improved process for getting IP out of Indiana Universities so that it can be commercialized
4. A partnership of all the players with a strong teaming attitude and knowledgeable leaders acting as catalysts not overlords
5. Attracting, retaining, and upgrading defense electronics knowledge and tradecraft